United States Patent [19]
Kern

[11] Patent Number: 4,601,545
[45] Date of Patent: Jul. 22, 1986

[54] VARIABLE POWER LENS SYSTEM

[76] Inventor: Seymour P. Kern, 22 Timbergate, Irvine, Calif. 92714

[21] Appl. No.: 610,686

[22] Filed: May 16, 1984

[51] Int. Cl.[4] G02F 1/13; A61F 1/16
[52] U.S. Cl. ..... 350/347 V; 350/331 R; 350/332; 350/336; 623/4
[58] Field of Search ..... 350/331 R, 347 V, 347 R, 350/333, 336; 3/13 A

[56] References Cited

U.S. PATENT DOCUMENTS

4,010,496	3/1977	Neefe	3/13
4,373,218	2/1983	Schachar	3/13
4,385,805	5/1983	Channin	350/347 V X
4,435,047	3/1984	Fergason	350/334

FOREIGN PATENT DOCUMENTS

2011640	7/1979	United Kingdom	350/347 V

Primary Examiner—John K. Corbin
Assistant Examiner—Richard F. Gallivan
Attorney, Agent, or Firm—Leonard Tachner

[57] ABSTRACT

There has been provided a variable lens. In one form the lens power may be varied and in another the power may be selectively fixed in a carrier material. There are no moving mechanical parts but instead an optically active molecular material such as liquid crystals. In one embodiment, the lens and control means for varying the power of the lens are mounted on a common substrate. The lens may be a single optical element or a multi-element device such as a Fresnel lens. A variable gradient index of refraction is achievable by applying a controlled stimulus field to the lens. For example, a geometrically configured matrix of electrical voltages, each at a selected addressable location relative to the optically active material, provides the gradient in one embodiment. A thin film embodiment finds applications in magnifying glasses, cameras, telescopes, microscopes, as well as for intraocular and contact lenses for the human eye.

34 Claims, 16 Drawing Figures